

**Generally:**

Surfacing consists of two major types, Asphalt and Portland Cement Concrete.

The cross slope of the driving lane is .021 ft. per ft. and the shoulder is .042 ft. per ft. for new construction.

The aggregate base should be carried out to the foreslope.

The Materials and Research Division develops the entire pavement section. This includes:

- Thickness and type of Base (dense, blended, or permeable)
- Thickness of Surfacing (Asphalt and Concrete)
- Class of Aggregate to be used.
- Type and quantity of Asphalt for Asphalt Pavements

**III-06.01 Asphalt Pavements****III-06.01.1 Reconstruction**

This occurs when the roadway is totally rebuilt from the subgrade on up through the base and a new asphalt surface is constructed on the base. This would include making changes in the vertical and horizontal alignments and widening if necessary.

**III-06.01.2 Structural Overlays (Over 1 ½")**

There are times when all that is needed on a particular segment of roadway is to place an asphalt overlay to give it added strength and to extend its service life. The thickness of the overlay is determined by Materials and Research for the service life designated in the Design Guides.

**III-06.01.3 Milling**

Sometimes the existing surface is rutted, has sufficient structural strength, or maybe the section is badly out of shape. Milling is a process where some of the surfacing is removed, (ex. 2"), to correct these conditions.

There may be times milling will be used just to make room for new asphalt.

**III-06.01.4 Overlay Transition Tapers**

To reduce the chances of the thin sections, (at the ends of bridges, at railroad tracks, at the ends of the project, etc.), from raveling, the designer should require that the transitions be milled, especially if the anticipated paving date is late in the construction season. Paving transitions placed in the late fall may not adhere to the existing pavement surface and this treatment allows for a thickened transition section. An example note may be used to cover this work requirement as follows:

408 P01        MILLED TAPER: HBP overlays and patches placed after September 5, shall require a milled transition tapered at the rate of 50 ft. per one inch depth of overlay at each end of the overlay. The costs for milling the transitions shall be incidental to the unit price bid for "Hot Bituminous Pavement CL..."

A detail may also be included in the plan sheets.

**III-06.01.5 Shoulder Drop-offs/ Edge Slough**

The project plans should address the shoulder edge drop-offs that result from overlays. The drop-off may be corrected by providing a slough with a minimum slope of 6% that extends from the top of the overlay to the shoulder surface. Another method is to provide for resurfacing the shoulder and forming a new slough. The new slough may vary in slope and treatment. For both methods the shoulder should be compacted. A plan note or typical section may be used to illustrate the method of drop-off correction. Examples of the shoulder drop-off correction are shown in the Standards for Preventive Maintenance in Section I-06.05.

**III-06.01.6 Thin Lifts and Intermittent Patching**

As a preventive maintenance measure, a thin lift, (max. 1 1/2"), of asphalt will be placed on the entire segment of roadway or it will be placed intermittently along the roadway where needed. See the District Design details in Section III-22 of this manual.

**III -06.02 Portland Cement Concrete (PCC) Pavement****III-06.02.1 Reconstruction**

This process is used when the PCC has reached a condition where it is no longer cost effective to repair. The surfacing is removed, the subgrade reworked, the roadway may need widening, the vertical and horizontal alignment may need to be changed and new base and surfacing is placed.

The existing surfacing, be it asphalt, PCC or aggregate, is salvaged and recycled into the base. Generally salvaged material is not used in the surfacing.

These pavements could be plain jointed with dowels or continuously reinforced. Materials and Research will recommend if continuously reinforced should be used.

### **III-06.02.2 White Topping**

White topping is where a relatively thin (4"-6") layer of PCC is placed over an existing asphalt pavement. This could be considered if the existing surfacing is rutted or badly deteriorated.

This can also be done on concrete as either a bonded or unbonded overlay.

### **III-06.02.3 Concrete Pavement Repair (CPR)**

This work consists of repairing spalled joints, broken slabs, installing dowel bars in existing joints to reestablish load transfer, and grinding the surface to improve the ride.

When making repairs to continuously reinforced concrete, the continuity of the reinforcing should be reestablished.

### **III-06.02.4 Expansion, Contraction and Tied Longitudinal Joints**

#### **Generally:**

Expansion joints should not be used except at bridges.

Contraction joints are used on all concrete pavements.

Generally, the maximum width of concrete that is tied together is 40 feet.

### **III-06.03 Driveway and Guardrail Surfacing Policy**

#### **III-06.03.1 Rural projects**

Generally, the following will govern the surfacing of driveways and under guardrail, keeping in mind there may be exceptions that can be handled on a case-by- case basis:

- For approaches and private drives, pave to the radius.
- For section line (if paved) and county roads, pave to the R/W line.
- If the drive was previously paved and is disturbed during the construction, it will be paved.
- Surfacing is to be provided under guardrail to a point 3 feet beyond the posts.

**III-06.03.2 Urban Projects**

- Generally the driveway will be paved to the R/W line or to the limit of the construction easement that is needed to blend the drive into the adjacent property or connect with existing surfacing.
- The design used for driveways should be the same as the respective cities use. These may need to be thickened in industrial areas.

**III– 06.04 Shoulder Rumble Strips**

Shoulder rumble strips will be installed on the following highways as defined in the NDDOT Highway Classification and Performance Guidelines.

Shoulder rumble strips may be considered on other highways at locations that have high ROR crash rates, provided there is adequate shoulder width to receive the rumble strips. The Planning and Programming Division - Traffic Operation Section will make recommendations regarding the crash analysis. The District Engineer will make recommendations regarding the structural adequacy of existing shoulders and slough to receive rumble strips.

Shoulder rumble strips will be installed in conjunction with rural highway projects where paved shoulders are constructed, reconstructed, or overlaid as part of a highway construction contract. Shoulder rumble strips should not be installed where major surfacing work is scheduled or anticipated within the next three years.

Shoulder rumble strips will not be installed on rural highways which have a paved shoulder width of less than 4.0 feet, except as provided for the left, or median shoulder on rural Interstate and divided highways.

Shoulder rumble strips will not be installed within urban areas, where there is curb and gutter, where the highway posted speed is 45 mph or less, across bridge approaches and decks, or adjacent to guardrail if the clear path between the shoulder rumble strip and guardrail is less than 5 feet.

**III–06.04.1 Interstate and Interregional Divided Highways**

- Continuous rumble strips should be provided on the right and left shoulders of all rural interstate roadways as shown in Table 06.04.1
- Intermittent or continuous rumble strips should be provided as shown in Table 06.04.1 on interregional divided highways.

- At exit ramps rumble strips should end before the ramp taper and begin again at the gore nose.
- At entrance ramps the rumble strips should end at the gore nose and begin again after the ramp taper.

**Table 06.04.1 - Types of Shoulder Rumble Strips**

Highway Type	Shoulder	Shoulder Rumble Strip Types
Interstate	Right (Outside)	<b>Type 1 - 16" Continuous</b> Continuous milled rumble strips, 16" wide, located 2' from the edge of travel lane.
	Left (Inside/Median)	<b>Type 1 - 16" - Continuous</b> Continuous milled rumble strips, 16" wide, located 1' from the edge of travel lane. <i>Install only when a 2' or greater paved shoulder width exists.</i>
Multilane, Divided	Right (Outside)	<b>Type 2 - 12" - Intermittent (40' milled strip/10' gap)</b> Intermittent milled rumble strips, 12" wide, located 1' from the edge of travel lane.
	Left (Inside/Median)	<b>Type 2 - 12" - Continuous</b> Continuous milled rumble strips, 12" wide, located 1' from the edge of travel lane. <i>Install only when a 2' or greater paved shoulder width exists.</i>
Multilane, Undivided; Two-lane; Paved Shoulder \$6'	Both (Rt & Lt)	<b>Type 3 - 12" - Intermittent (40' milled strip/10' gap)</b> Intermittent milled rumble strips, 12" wide, located 1' from the edge of travel lane.
Two-lane; Paved Shoulder, \$ 4' and < 6'	Both (Rt & Lt)	<b>Type 4 - 12" - Continuous</b> Continuous milled rumble strips, 12" wide, located 1' from the edge of travel lane. <i>Installed only when documented ROR crash problem and little or no bicycle traffic is expected.</i>

**III-06.04.2 Interregional and State Corridor Two-Lane Highways**

- Continuous rumble strips should be provided as shown in Table 06.04.1 on interregional highways with shoulder widths of four feet or greater.
- On routes which are within designated city or urban limits, rumble strips should not be used.

- Continuous rumble strips should be provided as shown in Table 06.04.1 on state corridor highways with shoulder width of four feet or greater and the average daily traffic (ADT) is 2,000 or greater.
- Rumble strips should be discontinued across the full width of all public and private (residential and commercial) road approaches, scenic and historic marker turnouts.
- Rumble strips should be continued along the full length, including tapers, of mailbox turnouts and field drives.
- Where the shoulder width is  $< 4$  feet and where there is little or no bicycle use, but run-off-the-road crashes are high, rumble strips should be considered.

### III-06.04.3 Bicycle Travel Considerations

The AASHTO Guide for the Development of Bicycle Facilities 1999, indicates a paved shoulder width of 4 feet to accommodate bicycle travel. Further, the guide indicates shoulder rumble strips are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of 1 foot from the rumble strip to the traveled way, 4 feet from the rumble strip to the outside edge of paved shoulder, or 5 feet to adjacent guardrail, curb, or other obstacle.

The NDDOT guidelines accommodate bicycle travel on two-lane and multilane highways as follows:

- For paved shoulders greater than, or equal to 6 feet, bicycle travel is accommodated between the rumble strip and outside edge of the shoulder. The shoulder rumble strip will have an intermittent design to provide bicyclists a chance to temporarily cross over in the travel way to avoid debris and object blocking the shoulder, and to make turning movements.
- For paved shoulders less than 6 feet, bicycle travel is accommodated along the outside edge of the edge of the travel lane. The shoulder rumble strip will have a minimum offset of 12 inches from the travel lane and a continuous design.
- The width of the shoulder rumble strips have been narrowed to 12 inches.
- The rumble strips will be discontinued if the clear path between the rumble strip and guardrail or other obstruction is less than 5 feet.
- As shoulder rumble strips will require bicyclists to ride farther out from the vehicle induced wind-sweep shoulder edge, periodic sweeping as part of regular maintenance activities may be necessary to remove debris to safely accommodate bicycle travel.

**III-06.04.4 Maintenance Considerations**

The shoulder rumble strips may be covered during patching and overlay activities. A reasonable attempt should be made to reinstall the rumble strips, thereby maintaining the consistency of shoulder rumble strips on the highway. If it is not possible or feasible to maintain the rumble strips due to construction methods or insufficient shoulder width, the rumble strips should be discussed in the project concept report and a decision item included for approval. Alternative installation methods may be considered, such as using the rolled-in type of rumble strip. The rolled-in method may be useful for patching and overlay completed by district personnel.

The shoulder rumble strips may be covered during chip and sand sealing activities. The District Engineer may limit chips to the travel lanes only and sand the shoulders, or eliminate the chips or sand on the shoulders altogether.

The shoulder rumble strips milled into new or existing bituminous pavements will be fog sealed to protect the milled rumble strips from oxidation and moisture. The fog seal will consist of an application of SS-1h or CSS-1h at a rate of 0.10 gal/sy across the full width of the milled rumble strip. The District Engineer may eliminate the requirement to fog seal the rumble strips.

**III-06.04.5 Installation**

- Shoulder rumble strips in concrete — see Standard Drawing D-960-2.
- Shoulder rumble strips in asphalt — see Standard Drawing D-960-2.

**III-06.05 Typical Detail Sheets and Location**

Refer to Appendix III-06 A.

**Appendix III-06 A Typical Detail Sheets and Location**

The location of typical detail sheets can be found [www.nd.us/dot](http://www.nd.us/dot)

Click on "Manuals," "Design Manual," "Plan Preparation Guide."

**Section 100 - General Provisions**

Basis of Estimate - BASIS.dgn

**Section 200 - Earthwork**

- Excavation and embankment details
  - Approach slope flattening - DAPPRSL.dgn
  - Ditch block slope - DITCHBL.dgn
  - Additional embankment at centerline pipe extension - PIPEXT.dgn

**Section 400 - Bituminous Pavements**

- Surfacing
  - Shoulder to slope protection surfacing - SLPROT.dgn
- Patch and thin-lift overlays
  - HBP overlay transition - DOVLTRAN.dgn
  - Milling and overlay - MOTEP.dgn
- Project Details
  - Surfacing at guardrail
    - Typical surfacing at 3 Cable - HBP3GR1.dgn
    - Typical surfacing at bridge ends with guardrail - HBPGRB.dgn  
HBPGRP1.dgn  
HBPGRP2.dgn
  - Private/Section Line/Field Approaches
    - Approach details - APPROACH.dgn

**Section 500 - Rigid Pavements**

- Reconstruction
  - Joint details
    - Dowel bar placement - DBPFDR.dgn
    - Pavement repairs at finger joint - DSLSLAB.dgn



1 panel or more - JD.dgn  
Joint details - JOINTD.dgn  
38' PCC pavements - PCCJTS and PCCSKJTS.dgn  
Stitching at centerline - STITCH.dgn

Reinforcement details

Existing mainline - DXREINF.dgn  
Existing at culverts - LCULREINF.dgn

■ Concrete Pavement Repair

Full-Depth Repair

Continuously reinforced - CONFDR.dgn  
Removal at joint repair - CONREMV.dgn  
Removal of concrete & dowel bar placement - CONREMV2 and  
CONREMV3.dgn

Non-reinforced PCC pavement < 1 panel - CPRFD.dgn  
Non-reinforced PCC pavement > 1 panel - CPRMORE1.dgn  
Dowel bar placement - DBPFDR and DBPFDRZ.dgn  
Removal of continuously reinforced - REMFDR.dgn

Partial Depth Repairs

Method of maintaining joints - MJSR.dgn and SPALLRPD.dgn  
Spall repair (non-skewed joint) - SPALLRD.dgn

■ Dowel Bar Retrofit Details

Retrofit dowel bar installation - RDBI.dgn

■ Project Details

Ramps

Typical ramp section I-94 - RAMPSEC.dgn  
Typical ramp section I-29 - RAMPSEC2.dgn  
50:1 taper layout - SERAMPRAYM.dgn  
40:1 taper layout - SWRAMPRAYM.dgn  
50:1 typical section - TDRSECSE.dgn  
40:1 typical section - TDRSECSW1.dgn

## Section 700 - Miscellaneous Construction

## ■ Traffic Control

## Traffic Control

One-lane closure for median crossover - 1LNCL, 1LNCL2,  
1LNCLEW and  
1LNCLEWE.dgn

Northeast ramp connection detour - CSNEWHTDT.dgn

Northwest ramp connection detour - CSNWWHTDT.dgn

Mainline traffic control at ramps - DMLTCRI and DMLTCRI2.dgn

Northeast ramp connection - TCNERCWHT.dgn

Northwest ramp connection - TCNWWHTRC.dgn

## ■ Erosion Control

## Erosion Control

Bridge approach slabs - APPRSLABDRAIN.dgn

Wood Excelsior - DCULV\_ENDPROT.dgn

## ■ Temporary Bypass/Detours

## Temporary Bypass/Detours

Temporary connection joint details - DXOJTS.dgn

Median crossover joint details - DXOVJT.dgn

## ■ Culverts/Storm Drains/Edge Drains/Underdrains

## Culverts

Pipe culvert connection - PIPECNCT.dgn

Rural centerline culvert backfill - DRCCB.dgn

## Edge Drains

Edge drain discharge and splash blocks - DDEEDGE.dgn

Edge drain 3' splash block - DEDGDR.dgn

Edge drain 4'-6" splash block - DEDGDR6.dgn

Vegetation barrier - DVEGEDGE.dgn

■ Manholes/Catch Basins/Inlets

Manholes

Utility schedule - HYDRANT.dgn

Drainage summary sheet - DRASUM10.dgn

Adjust utility appurtenance - DUADJUS1.dgn

■ Fencing

Fencing

Snow fence layout at Interchange - DSNOWFENCE1.dgn

Snow fence layout at separation - DSNOWFENCE2.dgn

Cable fence detail - DCABLE & DCABLE1.dgn

■ Highway Traffic Signals

Highway Traffic Signals

Railroad signal details - PRELIMRRD.dgn